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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

CHANG, JON CARLTON

ART UNIT PAPER NUMBER

2623

DATE MAILED: 07/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/901,508

Applicant(s)

DANCE, CHRISTOPHER R.

Examiner

Jon Chang

Art Unit

2623

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 18-29 is/are rejected.
- 7) ☒ Claim(s) 9-17 and 30 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 December 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>4.8</u> . | 6) <input type="checkbox"/> Other: ____. |

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 5-6, 8, 18-19, 21-23 are rejected under 35 U.S.C. 102(b) as being anticipated by the article, "The Cascaded Hough Transform as an Aid in Aerial Image Interpretation" by Tuytelaars et al. (hereinafter "Tuytelaars").

Regarding claim 1, Tuytelaars discloses a method for estimating perspective in an image, comprising:

(a) applying at least one transform to the image to transform the image into a coordinate space representative of directional statistical characteristics in the image (section 2.2, the second and/or third Hough transform); and

(b) processing the transformed image to determine at least one pencil which aligns with said directional statistical characteristics present in the image (the transformed image is processed to determine the vanishing point, section 2.2. The vanishing points are where several lines intersect, i.e., pencils).

Regarding claim 5, Tuytelaars discloses a method according to claim 1, wherein (a) comprises:

applying a transform to the image to transform the image into line space, in which a line in the original image is transformed into a point value in line space (sections 2.1 and 2.2, this is a characteristic of the Hough transform).

With regard to claim 6, Tuytelaars discloses a method according to claim 5, wherein the line space is slope-intercept space, said transform being parameterized by slope and intercept coordinates (sections 2.1 and 2.2, this is a characteristic of the Hough Transform).

As to claim 8, Tuytelaars discloses a method according to claim 5, wherein the transform includes summing values taken along lines through pixels of the image (section 2.2; this is met by the third Hough transform which accumulates collinear peaks, i.e., peaks along the same line, from the second Hough transform).

As to claim 18, Tuytelaars discloses a method according to claim 5, wherein (b) comprises applying a second transform to further transform the transformed image from line space to a pencil space coordinate system, the pencil space coordinate system being such that a curve in line space is transformed into a point value in pencil space, indicative of a pencil aligned with characteristics in the image (section 2.2; this is the second Hough transform; a curve, e.g., a line, is transformed to a point in the second Hough space, or pencil space).

As to claim 19, Tuytelaars discloses a method according to claim 18, wherein the pencil space coordinate system is parameterized by the rate of change of line slope, and a first slope (section 2.2; this is an inherent aspect of performing a second Hough transform on the results of a first Hough transform).

As to claim 21, Tuytelaars discloses a method according to claim 18, wherein the second transform includes summing values taken along lines through values of the transformed image (section 2.2; this is met by the third Hough transform which accumulates collinear peaks, i.e., peaks along the same line, from the second Hough transform).

Referring to claim 22, Tuytelaars discloses a method according to claim 21, wherein the second transform includes a non-linear function of values from the first transformed image (the second transform is a Hough transform which is non-linear).

With regard to claim 23, Tuytelaars disclose a method according to 21 wherein the second transform includes a minimum threshold function, such that points below a minimum threshold value are ignored (section 2.2; only local maxima are transferred to the next stage).

3. Claims 27-29 are rejected under 35 U.S.C. 102(b) as being anticipated by the article, "Fast Parallel Discrete Approximation Algorithm for the Radon Transform" by Brady et al. (hereinafter "Brady").

Regarding claim 27, Brady discloses a method for calculating a sum of discrete pixel values along at least part of a target curve defined by a first direction and a set of stepping-values in said first direction at which a discretization of said target curve steps perpendicularly to said first direction, the method comprising:

(a) calculating a plurality of partial line sums of pixels along partial lines in a first direction parallel to a coordinate axis, each partial sum being parameterized by an intercept and a variable position away from the intercept (section 2),

(b) calculating the sum of pixel values by combining respective partial line sums representative of segments of the target curve at at least two of the said stepping-values (section 2).

Regarding claim 28, Brady discloses a method according to claim 27, wherein the target curve is a line (section 2).

Regarding claim 29, Brady discloses a method according to claim 29, further comprising repeating (b) to calculate sums at different values of slope intercept (e.g., not algorithm 1).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tuytelaars.

Regarding claim 24, Tuytelaars does not teach that (a) and (b) are performed a first time to detect a first pencil aligned in a first direction, and wherein (a) and (b) are

performed a second time to detect a second pencil aligned in a second direction different from the first direction. Tuytelaars appears to detect first and second pencils of different directions simultaneously. However, performing the steps a first and a second time is seen as obvious over Tuytelaars method. To separate combined steps is viewed as decision based on designer preference.

Claim 25 is drawn to an apparatus which corresponds to the method of claim 1. The discussion provided above for claim 1 is applicable to claim 25. Tuytelaars does not explicitly describe an apparatus for performing the method. However, given that the described method operates on real images (e.g., Fig.5), it would have been obvious and well within the skill level of one of ordinary skill in the art, to implement the method in some sort of apparatus.

Regarding claim 26, the second image transformer and second pencil detector would correspond to the second or third Hough transform described in section 2.2. A pencil detected in one particular stage would be of different direction from the previous stage since they are in different parameter spaces.

6. Claims 2-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Tuytelaars and the article, "Location and Recovery of Text on Oriented Surfaces" by Clark et al. (hereinafter "Clark").

As to claim 2, Tuytelaars does not disclose that said statistical characteristics are representative of text characteristics. However, this is well known in the art. For example, Clark, in an analogous environment, teaches applying the Hough transform to

estimate and remove perspective distortion in text document images (note abstract, and Fig.1). It would have been obvious to one of ordinary skill in the art to apply Tuytelaars' techniques to text document images, utilizing text characteristics as the statistical characteristics because both references are concerned with estimating perspective using the Hough transform, and Tuytelaars' teaching would yield improved processing for text images, and allow for recovery of any text in the field of view of a camera (Clark, section 1).

As to claim 3, Clark further teaches said statistical characteristics are representative of a direction of a text line in the image (e.g., Figs.1(a) and 1(b)).

Regarding claim 4, Clark further teaches that said statistical characteristics are representative of a direction of a boundary of a block of text (e.g., Fig.5).

7. Claims 7 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Tuytelaars and the article, "Contribution to the Determination of Vanishing Points Using Hough Transform" by Lutton et al. (hereinafter "Lutton").

As to claim 7, Tuytelaars is silent with respect to the line space is uniform angle space, said transform being parameterized by angle and distance to an origin of the image plane. However, Tuytelaars does suggest the use of a Gaussian sphere (section 2.3). Lutton provides a description of the use of a Gaussian sphere for the determination of vanishing points, and shows a Hough transform being parameterized by angle and distance to an origin, when using a Gaussian sphere (Section IIA, and Figs. 3 and 4). Since Tuytelaars suggests the use of a Gaussian sphere, one of

ordinary skill in the art would have looked to the prior art for the details regarding its use. Lutton provides such prior art. Therefore, it would have been obvious to combine the teachings of Tuytelaars and Lutton.

As to claim 20, Tuytelaars teaches the pencil space coordinate system is defined a Gaussian sphere (section 2.3), but is silent with regard to the pencil space coordinates system being defined by polar coordinates based on the Gaussian sphere. Lutton teaches this (section IIA, Fig. 4). Since Tuytelaars suggests the use of a Gaussian sphere, one of ordinary skill in the art would have looked to the prior art for the details regarding its use. Lutton provides such prior art. Therefore, it would have been obvious to combine the teachings of Tuytelaars and Lutton.

Allowable Subject Matter

8. Claims 9-17 and 30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

References Cited

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent 5,285,504 to Pavlidis et al. discloses using projection profiles to compensate for page tilt.

U.S. Patent 5,638,116 to Shimoura et al. teaches calculating vanishing point of a road by performing the Hough transform twice.

U.S. patent 5,651,075 to Frazier et al. teaches correcting perspective distortion in an automated license plate locator and reader.

U.S. Patent 5,832,110 to Hull image registration using projection histogram matching.

U.S. Patent 6,473,517 to Tyan et al. teaches segmenting character regions using projection profiles.

U.S. Patent 6,304,313 to Honma teaches perspective correction of a document image by first dividing the image into blocks.

U.S. Patent 6,400,848 to Gallagher teaches perspective determination and correction using the Hough transform.

"Accurate Line Parameters from an Optimising Hough Transform for Vanishing Point Detection" by Palmer et al. teaches using the Hough Transform to locate vanishing points.

"Vanishing Point Detection by Line Clustering" by McLean et al. teaches a method for detecting vanishing points.

"Vanishing Point Detection by Voting Scheme" by Gamba et al. teaches a method for detecting vanishing points.


"The Cascaded Hough Transform" by Tuytelaars et al. teaches using successive Hough Transforms to detect vanishing points.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jon Chang whose telephone number is (703)305-8439. The examiner can normally be reached on M-F 8:00 a.m.-6:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703)308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Jon Chang
Primary Examiner
Art Unit 2623

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July 12, 2004